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Research

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13. ABSTRACT (Maximum 200 Words) The purpose of this proposal is to support a summer training program for undergraduate students interested in scientific research. The students selected for fellowships participate in cancer-related research in laboratories located in the Department of Molecular Medicine of the University of Texas Health Science Center at San Antonio. Students are placed in different laboratories and assigned a faculty mentor, depending on their expressed interests. During the 10-week summer fellowship period, they participate in actual research projects in the mentor's laboratory, and attend a weekly seminar to learn about topics relevant to breast cancer research. At the end of the fellowship period, each student delivers a formal presentation on their projects to the department. The overall goal of the program is to expose talented young scientists to real research, in the hope that at least some of these talented students will be motivated to pursue a career in cancer-related research. Thus far, this grant has supported a group of 6 students for the summer of 2003, and 6 new students are slated to arrive in the department on June 7, 2004. The response to the program has been overwhelmingly positive, both from the students and from the participating laboratories.				
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INTRODUCTION

This undergraduate summer training award was designed to fund fellowships to support talented undergraduate students to perform cancer-related research during 10-week summer periods each year. The purpose of this undergraduate training program is to expose talented young students to cancer-related research in the context of a real research laboratory. Each selected student is assigned a faculty mentor, and they participate in a research project in the mentor's laboratory. Students also participate in weekly seminars to learn about topics relevant to breast cancer research, and they give a brief formal presentation on the work they performed at the end of the fellowship period. The hope is that this program will attract talented young people to train as scientists and pursue cancer research as a career.

BODY

For the summer of 2003, we supported 6 students using these DOD training grant funds. Each student was paid a stipend of \$4,000 for the 10-week fellowship period, and housing was provided near the department by the Texas Research Park Foundation. Each participating laboratory was allocated \$500 to help defray the cost of laboratory supplies for the students' research projects. The 6 participating students were selected from a total of over 30 complete applications. Students were selected on the basis of college grade point averages, science coursework background, letters of reference and their interest in pursuing cancer-related research. Below is a list of the participating students and a summary of their research experiences. Four of the six students self-identified themselves as Hispanic on employment applications.

Brian Wilson was a junior Biochemistry major at the University of Texas at Austin. He has an interest in cancer research, especially that utilizing biochemical methods. He was assigned to the laboratory of Dr. Alan Tomkinson for the summer. His project involved expressing the enzymes Fen 1 and Rad 27 in bacteria and purifying the proteins from bacterial extracts using affinity and ion exchange chromatography. The purified proteins were then used for studies of their biological activity and protein interactions *in vitro*. The mammalian Fen1 and the yeast Rad27 are important for DNA replication and DNA repair processes in cells in response to DNA damage. At the end of the fellowship, he presented his work in a talk entitled "Purification of Fen1 and Rad27".

Rose Broderick was a senior at St. Mary's University, with a major in Biochemistry. She has an interest in biomedical research and intends to attend graduate school. Rose was assigned to the laboratory of Dr. Renee Yew for the summer. Her project involved investigating the role of the tumor suppressor protein pRb in DNA Replication. She purified *Xenopus* and human Rb fusion proteins expressed in bacteria, and utilized a *Xenopus* extract system to test their activities in DNA replication initiation. She was able to demonstrate an inhibitory effect, and tested the interaction of *Xenopus* Rb with various proteins known to be involved in the initiation of DNA replication. At the end of the fellowship period, she presented her work in a talk entitled "The Function of Retinoblastoma in the Initiation of DNA Replication".

Charlene Fajardo was a junior at Chaminade University in Hawaii and had previously participated in neurobiology research at two different institutions. She is interested in a career in cancer-related research, and was assigned to the laboratory of Dr. Tom Boyer for the summer. Charlene's project involved looking for proteins which could interact with the protein encoded by BRCA1 tumor suppressor gene which (when mutated) predisposes to hereditary breast and ovarian cancer. The normal (nonmutated) BRCA1 protein is involved in DNA repair signaling in response to DNA damage. She generated stable cell lines expressing an epitope-tagged BRCA1 protein, which could then be used to isolate protein complexes for biochemical characterization. At the end of the fellowship, Charlene presented her work in a talk entitled "In Search of BRCA1 Protein Complexes".

Kristin Kepler was a junior at the University of Nebraska-Lincoln, majoring in Biological Sciences. She plans to pursue a Ph.D. degree in a basic science and wants to do biomedical research. Kristin was assigned to the laboratory of Dr. Paul Hasty for the summer, and her project in Dr. Hasty's lab involved the generation of several targeting vectors for use in creating mouse "knock-out" models. She generated targeting vectors to be used by the laboratory in creating mice mutant for several genes involved in DNA repair, including Blm (the Bloom's syndrome gene), RecQL4 (a helicase enzyme involved in unwinding of DNA) and Top3 (a topoisomerase enzyme involved DNA topology). At the end of the summer, she presented her work in a talk entitled "Summer Research".

Mary Yanez was a senior at the University of Texas -Pan American majoring in Biology with a minor in Chemistry and a minor in English. She was assigned to the laboratory of Dr. Sang-Eun Lee for the summer. Mary's project involved investigating the mechanism of DNA double-strand break repair using yeast as a model system. She performed experiments designed to test whether histone modification and chromatin remodeling played a role in DNA repair. At the end of the summer, she presented her work in a talk entitled "DNA Double-Strand Break Repair". Maria also used the work that she performed in her summer fellowship in a poster presentation for Hispanic Engineering and Science Technology Week at UT-Pan American in October 2003.

Aaron Wickley was a junior at Brigham Young University-Hawaii majoring in Biochemistry. Aaron was assigned to the laboratory of Dr. Hai Rao for the summer, where he worked on a project involving substrate specificity in protein degradation by the proteasome complex. He tested the interaction between components of two different pathways to determine if the 2 pathways intersected. He also generated plasmid constructs to test the hypothesis that the UBL protein domain of 2 particular proteins determined their substrate specificities, by switching the UBL protein domains between the two proteins and testing whether their substrate specificities had changed. He presented his work at the end of the fellowship in a talk entitled "The Function of the UBL Motif in Proteolysis".

For the fellowship program for the summer of 2004, we have selected 6 new participants from a total of 60 complete applications. The 10-week fellowship period will start on June 7, 2004. The participating students are:

1. Sean Baran, University of Colorado-Boulder.
2. Claire Gordon, Rice University.
3. Nathan Gray, Abilene Christian University.
4. Pamela Kim, Vassar College.
5. Sonia Martinez, Texas Lutheran University.
6. Alan Swearingen, St. Edward's University.

In addition to these 6 students who have committed to participating in the summer program, we initially offered positions to two other students (Edward Cardenas, University of Texas at San Antonio and Kelly Cavazos, Massachusetts Institute of Technology), but they declined to participate based on accepting other offers of summer employment.

KEY RESEARCH ACCOMPLISHMENTS

Since this is a training grant, we do not have any research accomplishments to report. However, in the past grant period, we have advertised our program in a number of ways, received and evaluated student applications, provided summer research opportunities to undergraduate students, organized and participated in educational weekly summer seminars to expose students to breast cancer-related research, and organized formal student presentations at the end of the summer fellowship period.

REPORTABLE OUTCOMES

Not applicable to this training award.

CONCLUSIONS

The Summer Undergraduate Fellowship program at the Department of Molecular Medicine / Institute of Biotechnology of the University of Texas Health Science Center at San Antonio is running smoothly. Last summer (2003) we hosted 6 students using funds from this DOD training award. The students were selected from over 30 complete applications, and spent 10 weeks in a specific laboratory performing biomedical research with a specific faculty mentor. They also participated in a weekly seminar series in which faculty members described their research at a level appropriate for undergraduate students. At the end of the fellowship period, each participating student gave a formal presentation describing the work they had performed during the fellowship. The program was judged to be a success by participating students and faculty alike. For the summer of 2004, we have selected 6 student participants from a total of over 60 complete applications. The increased number of applications may be due in part to better awareness of the program now that it is established. We are looking forward to another successful summer research program this year.

REFERENCES

Not applicable to this training grant progress report.

APPENDICES

No appendices.